

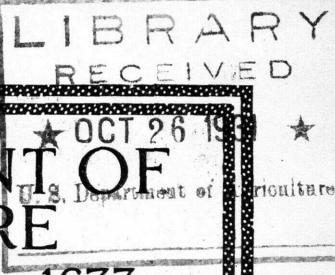
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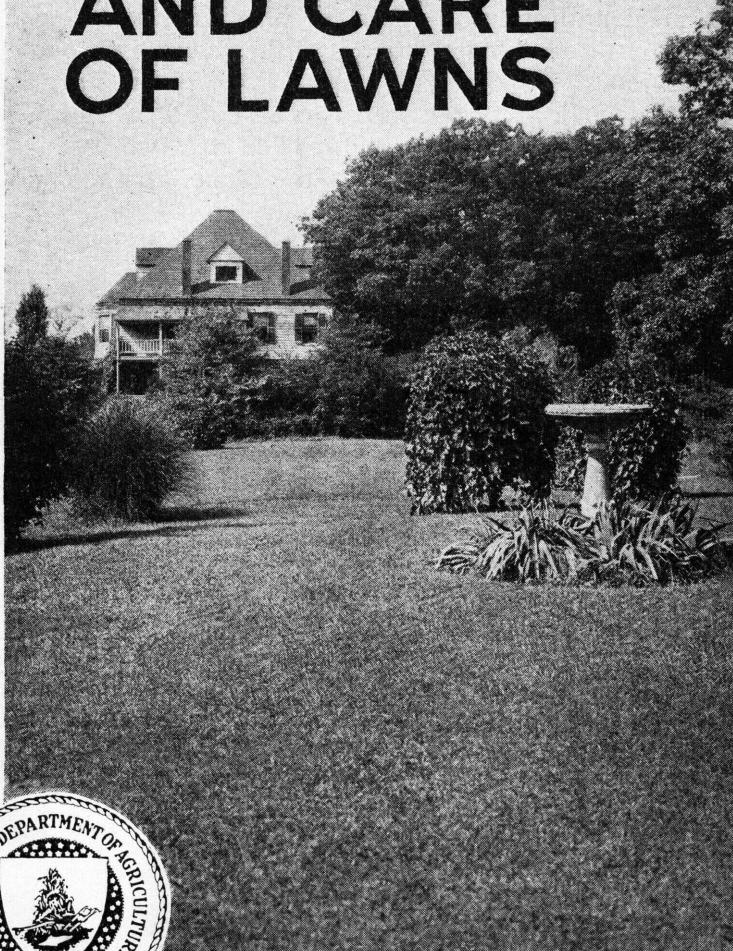
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U. S. DEPARTMENT OF  
AGRICULTURE  
FARMERS' BULLETIN No. 1677



Rev. ed.  
follows

# PLANTING AND CARE OF LAWNS



**L**AWN MAKING is relatively simple and does not require an expert. Certain factors, though—physical and climatic—must be observed, and constant care is needed to keep the lawn in good condition.

A properly prepared seed bed and seed of a high standard of purity and germination are two essentials. A good garden loam is the most satisfactory soil. Proper fertilizing is necessary.

There is a wide variation in the soil and climatic requirements of turf grasses. To attain success, the lawn maker should consider these in choosing a type of grass.

Insects and moles damage lawns and must be controlled. Brown-patch disease is controlled by mercury compounds.

Stoloniferous grasses such as Bermuda, centipede, and St. Augustine are more quickly established by the vegetative method of planting than by sowing the seed.

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Washington, D. C.

Issued October, 1931

**CORRECTIONS FOR FARMERS' BULLETIN 1677, PLANTING AND CARE  
OF LAWNS, EDITION OF 1931**

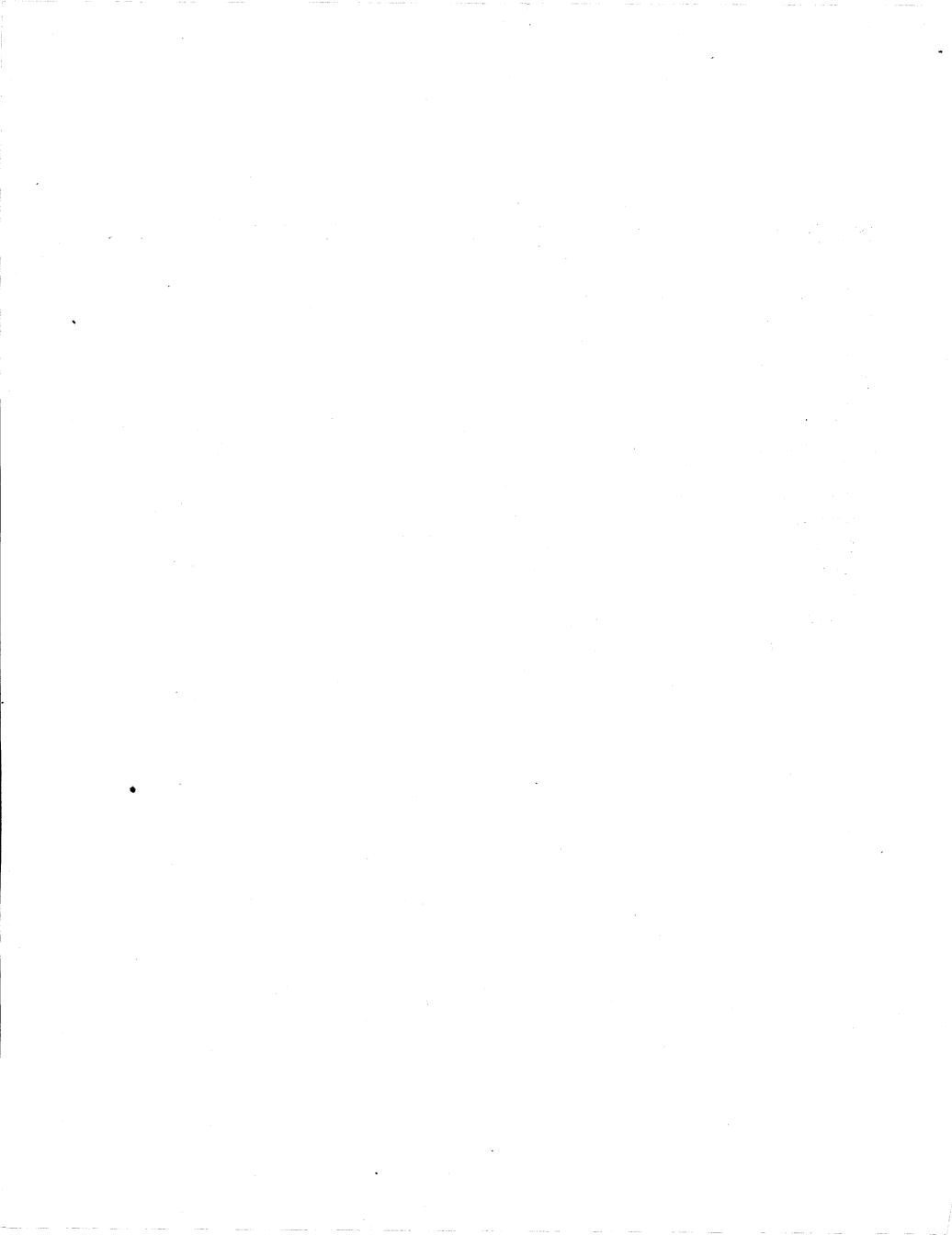
Page 12, last line of second paragraph should read: "rate of 25 to 30 pounds to 1,000 square feet."

Page 12, seventh line of last paragraph should read: "at the rate of 20 or 25 pounds", etc.

Page 15, last sentence in second paragraph should read: "The mower should be set to cut at a height of at least 1 inch and preferably more during midsummer."

Page 15, next to last paragraph, the following should be substituted for the last two sentences: "Considerable success in crabgrass control has been attained by practicing high cutting and limited watering from late May to September 1. If the mower is set to cut 2 inches high during this period the heavy growth of lawn grass smothers most of the crabgrass seedlings, and infrequent watering prevents normal development of those plants that survive."

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# PLANTING AND CARE OF LAWNS

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## INTRODUCTION

A BEAUTIFUL GREEN LAWN is the ambition of most home owners. While many have this desire, few are willing to expend the effort necessary for a successful lawn. The cardinal principles for attaining and maintaining a perfect lawn are relatively simple and do not require the services of an expert, but it is necessary to adhere faithfully to the fundamentals, otherwise inferior lawns are sure to result. Even when these principles are carefully observed the outcome is sometimes disappointing, owing to a peculiar soil or climatic condition. In this bulletin an attempt is made to set forth in simple language practices that have in general resulted in the most satisfactory lawns, with the realization, however, that these suggestions will not meet all requirements. Sometimes the conditions under which a lawn is to be developed are so unusual as to require special treatment. When this becomes necessary, assistance can usually be obtained by writing to the State agricultural experiment station or to the United States Department of Agriculture.

## PREPARATION

In starting a new lawn attention must be given to subsurface drainage, grading and leveling the soil, kind of soil, preparation and fertilization of the seed bed, and the use of suitable seed. If any of these features are neglected the results are almost sure to be unsatisfactory.

## DRAINAGE

Where the subsoil is so compact that water does not pass through readily, tile draining will prove beneficial. Lines of 4-inch tiles spaced 20 to 30 feet apart, laid  $2\frac{1}{2}$  to  $3\frac{1}{2}$  feet deep with a fall of from 3 to 4 inches for every 50 feet, should ordinarily insure sufficient underdrainage. The surface should be carefully graded to insure good surface drainage. Water standing in pockets is sure to injure the grass.

## GRADING AND LEVELING

In grading and leveling, the topsoil, if of good fertility, should be removed and set aside to be replaced after the grading has been completed. Soils on most lawns, however, are inferior to the undisturbed soils of the vicinity, owing to the practice of covering the topsoil with subsoil from excavations mixed with more or less waste materials from building construction. Such soil should be removed to a depth of 4 inches or more and replaced by a good loam or covered to this depth with a good grade of topsoil. Where considerable filling around buildings is necessary, frequently waste materials such as bricks, boards, and pieces of concrete are used in making the fill, as this method is cheaper than to make the entire fill with soil. It is very difficult to maintain the moisture content of such lawns, especially during dry periods. Before seed is sown, this rubbish should be removed to a depth of about 2 feet and replaced with soil. The better quality of turf in years to come will more than justify the added expense involved.

Having given attention to these details, grade the ground so as to furnish surface drainage, though the slope should not be great enough to result in such rapid run-off that the water does not have a chance to penetrate the soil. It is a common practice to construct the lawn so that there is a gradual slope from the house in all directions. This slope should not exceed 1 to 2 per cent. Final leveling is likewise important, as any depressions will interfere with mowing and may hold the water long enough to injure seriously or even kill the grass. Proper leveling is a comparatively simple operation when the lawn is in course of preparation, but after the grass is established the operation is very difficult. Pools of rain water or irrigation water supplied to facilitate the settling of the soil will indicate low places, which should be filled in before the lawn is seeded.

## SOILS AND SOIL PREPARATION

While there are grasses that will grow to some extent on poor soils, all of them will thrive better on good soils. Everything considered, what is generally recognized as a good garden loam is about the most satisfactory soil for turf grasses. Unfortunately, not many people have such soil readily available, nor are they always able to purchase it at a reasonable price. It, therefore, becomes necessary to utilize to the best advantage the soil already at hand. Grasses do not ordinarily grow well on heavy clay, and where it is necessary to use such material a quantity of sand equivalent to a surface layer of 1 inch worked into the soil to a depth of 3 to 4 inches will improve the texture very materially. Where the soil is very sandy a similar layer of clay incorporated with the sand will be very beneficial.

Soils from excavations seldom have any organic matter, and this must be supplied in some form if one expects success in maintaining a good lawn. Organic matter not only improves the texture of the soil, especially clay soils, but it also increases the water-holding capacity and improves the drainage. Fine, thoroughly decomposed stable manure or mushroom soil can be used to supply organic matter. This should be thoroughly mixed with the soil, one-half ton to 1,000 square feet usually being sufficient. Where neither of

these is available some of the granulated peats will be found helpful. One should be careful, however, in the use of peats, as some of them are toxic to most plant life. In case of large lawns it is sometimes necessary to resort to the use of a green-manure crop, preferably a legume. In this way organic matter can be supplied by turning under the crop, but on the average lawn, manure or mushroom soil is more satisfactory.

#### PREPARATION AND FERTILIZATION OF SEED BED

The final preparation of the seed bed should start two or three weeks in advance of the most favorable time for sowing. The end results will fully justify great care in putting the seed bed in the best possible condition. An ideal seed bed is one that is firm but has a very finely pulverized surface. Thorough watering in advance of sowing is necessary to settle the soil and to give proper moisture to insure subsequent germination of many weed seeds that might later prove troublesome. The soil should be stirred occasionally with a garden rake or some other implement to destroy the weeds that have started.

A few days before sowing the seed a liberal application of fertilizer containing the three most generally needed plant-food elements—nitrogen, phosphorus, and potassium—is advisable. This may not be necessary provided a liberal application of well-rotted barnyard manure has been worked into the soil during grading and leveling. Even when manure has been used, however, some readily available fertilizer will insure an early, vigorous growth of grass. Organic fertilizers such as bone meal, cottonseed meal, sewage sludge, and poultry manure have been used with excellent results. These should be applied at the rate of 20 to 25 pounds per 1,000 square feet and thoroughly worked into the soil. Cottonseed meal and sewage sludge mixed with ammonium sulphate in the proportion of 3 parts of either the meal or sludge to 1 of the sulphate will be found to give somewhat quicker results. The mixture may be applied at the rate of 12 or 15 pounds per 1,000 square feet. Where these materials are not available or where the prices are out of proportion to the plant-food content, a complete fertilizer high in nitrogen, such as 6-8-4, can be applied at the rate of 25 to 30 pounds per 1,000 square feet. The fertilizer should be evenly distributed and raked into the soil a few days before the seed is sown.

#### SEED AND SEEDING

Lawns started with seed require all possible care to insure a good, thick stand of grass. Two essentials are a properly prepared seed bed and use of seed of a high standard of purity and germination. To attempt to reduce the cost of starting a lawn by economizing on seed is a poor policy. As a rule, city lawns are not large, and the difference in cost between light and heavy seeding is not great. A thick stand from the beginning is not only highly desirable but almost essential to assist in holding the weeds in check.

In the northern half of the United States the lawn should be started in the fall when weeds are less troublesome. Spring sowings are likely to be crowded out by weeds. Southern and less hardy grasses usually succeed best when sown in the spring. Fall sowings should be made early enough to enable the grass to become well

rooted before freezing weather, as it will then be in condition to start growth early in the spring and compete more successfully with the weeds.

It is regrettable that many home owners do not take much interest in starting a lawn in the fall. It is only after outdoor activities have been suspended for some time that the desire to work in the soil returns. Because of this many lawns are started in the spring, and a high percentage of failure results. Weed competition is especially great at this time and, furthermore, hot weather is likely to occur before the seedlings are well enough established to withstand such a severe test. Where spring sowings become necessary, the operation should take place as early as the ground can be worked. In fact, in the latitude of Washington, D. C., seed has been sown on bare ground in midwinter with fair results.

From 3 to 5 pounds of seed per 1,000 square feet is recommended, depending upon the size of the seed. If the seeds are large, the rate of sowing should be increased. In order to insure even distribution it is a good practice to divide the seed and broadcast one-half each way of the lawn. After sowing, the ground should be raked lightly and rolled and sprinkled later if the soil becomes dry. The surface of the ground should not be allowed to become dry until the seedlings are well rooted.

#### VEGETATIVE PLANTING

During the last few years there has been considerable interest in vegetative plantings due primarily to the wide use of this method of establishing creeping bent putting greens on golf courses. (Fig. 1.) The method has long been utilized in the case of Bermuda grass, and more recently in starting lawns with centipede and St. Augustine grass. In the case of stoloniferous grasses like those mentioned above, a good turf may be established in less time by the vegetative method of planting than with seed. Centipede grass and some strains of creeping bent are planted vegetatively only as no seed is commercially available. One method is to chop the runners into pieces an inch or so in length, broadcast these over the lawn, roll, then cover with a thin layer of soil or compost, and water immediately. The surface must not be allowed to become dry until the pieces of runners have rooted and started to grow. One or two pounds of stolons, or in the case of creeping bent 1 square foot, is enough for 10 square feet of lawn. Another method is to set plants or pieces of stolons 2 to 3 inches long in rows 8 inches apart with pieces 4 to 6 inches apart in the row. Spacing can be increased or decreased according to the amount of planting material at hand. Close spacing will naturally give a good sod in less time. Whichever method is used, it is essential that the material be kept moist both before and after planting. Unless unusual care is given to bentgrass lawns planted vegetatively, the results are sure to prove disappointing.

#### SODDING

One of the quickest ways to establish a lawn is by the use of sod, though it is usually difficult to obtain a good quality. The chief objection is the expense involved. In sodding, the soil should be prepared as for sowing seed, except that it should be somewhat more compact. Experience has shown that sods cut 1 inch thick are most

convenient to lay, and that in sods of this thickness new roots develop so that it becomes thoroughly established sooner than where the sod is thicker. To insure a level lawn the sod must be of uniform thickness and cut in true squares which will fit together perfectly.

#### ESTABLISHING GRASS ON SLOPES

Establishing grass on steep slopes is by no means easy. In fact, where the slope is very steep it is often impossible to maintain turf, and it is then necessary to resort to the use of some plant like Japanese honeysuckle or English ivy. Where the slope is not too steep, however, and where other conditions are not unfavorable, grass can be established if special attention is given to prevent washing and to keep the soil sufficiently moist for the seedlings. One of the best methods where seed is used is to cover the newly sown slope with loosely woven burlap tightly drawn and staked to hold it in



FIGURE 1.—Starting a centipede-grass lawn by vegetative plantings. St. Augustine, carpet, Bermuda, and the creeping bent are frequently started in this way also

place. Old burlap bags ripped apart are excellent for this purpose. The covering of burlap retains the moisture and prevents erosion or washing. The grass will come up through the meshes of the burlap, which need not be removed, as it soon decays. Everything considered, the most satisfactory method is to sod the slopes, though the cost, of course, is somewhat greater than that of seeding. Whether sodding or seeding is employed, special attention must be given to watering, as slopes dry out rapidly.

#### LAWN GRASSES

There is a wide variation in the turf grasses that succeed best under different soil and climatic conditions. It is impossible to suggest individual grasses or grass mixtures that will meet all requirements. On the basis of many years of practical as well as experimental results, recommendations are made for turf grasses in

various parts of the United States, as shown on the accompanying map. (Fig. 2.)

#### REGION 1

In region 1 (fig. 2), where conditions are favorable, Kentucky bluegrass has no superior for general use, as it has a strong root system and will stand much rough treatment. On soil well supplied with lime, organic matter, and plant food, Kentucky bluegrass can be sown alone with good results, though because of the fact that it starts off rather slowly, a small amount of redtop usually is sown with it. (Fig. 3.)

Where the soil is acid the bentgrasses, including colonial bent, seaside bent, South German mixed bent, and creeping bent, grow much better than Kentucky bluegrass. (Fig. 4.) In fact, the bents do well where Kentucky bluegrass is not able to survive and where

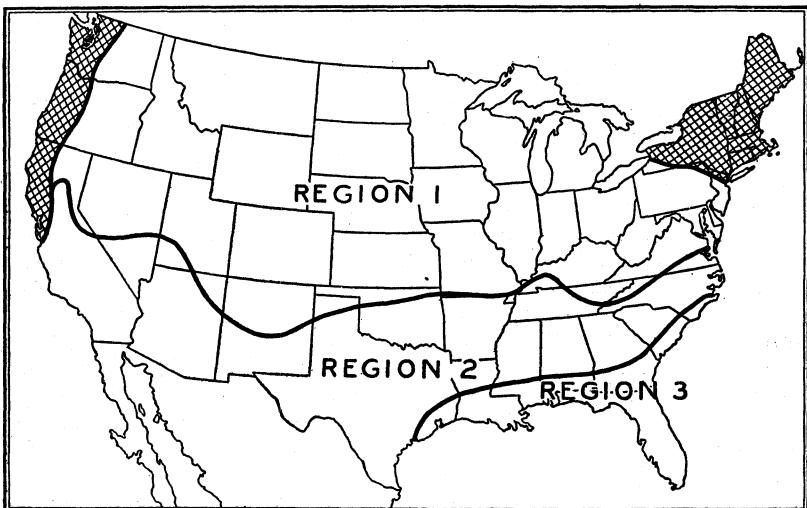


FIGURE 2.—Map showing regions of the United States to which the various lawn grasses discussed in this bulletin are adapted. Crosshatched areas in region 1 represent those areas in which the bentgrasses are most likely to succeed

there is little use of sowing grasses other than those tolerant to acid conditions. Soils especially suited to such grasses are quite usual in parts of New York and the New England States and along the Pacific coast of Oregon, Washington, and northern California. Seed of all these grasses is available with the exception of the creeping bent, which is the grass commonly used on golf greens. This grass is started vegetatively by planting pieces of runners or stolons. Due to the fact that putting greens established with creeping bent make such a beautiful appearance, home owners frequently wish to use it on the lawn. Creeping bent can of course be grown on the lawn as well as on the putting green, but it requires much attention in the way of watering, fertilizing, top-dressing, and treatment to control the brown-patch disease. Unless prepared to give the grass this extra attention, one is more likely to succeed with the ordinary lawn grasses.

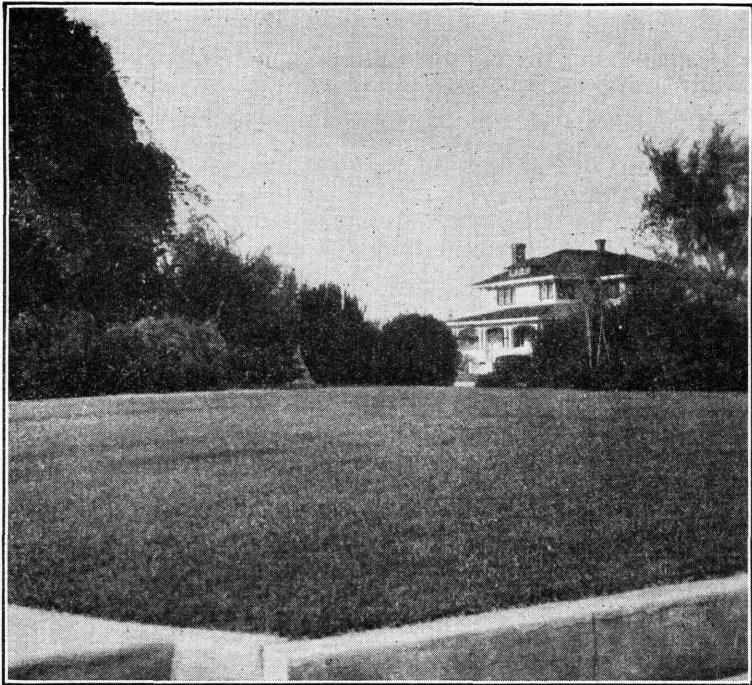


FIGURE 3.—Kentucky bluegrass. For a large part of region 1 this has no equal as a lawn grass

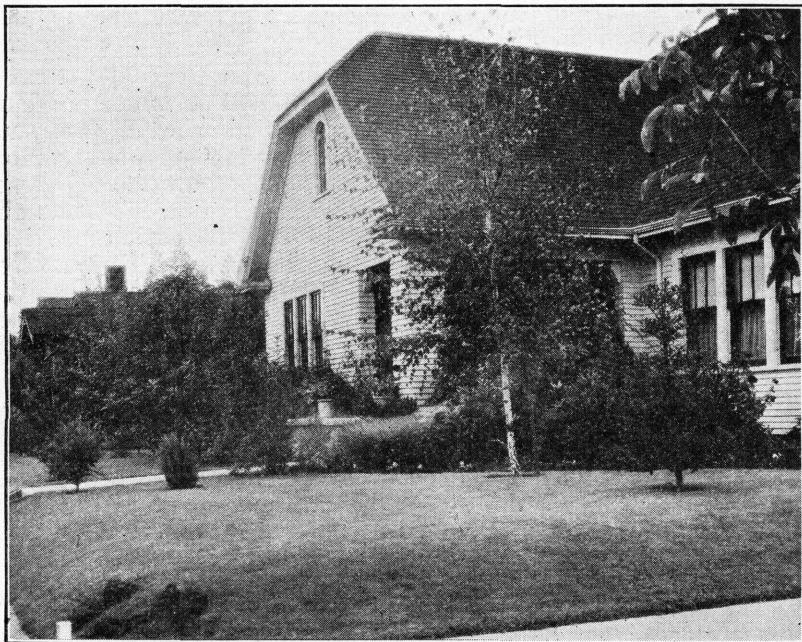


FIGURE 4.—A lawn of bentgrass. The bentgrasses make beautiful lawns in the Pacific Northwest and in New England when given the necessary attention

Like bentgrasses, the fescues, including red and Chewings fescue, are acid tolerant and suited to soil conditions similar to those favorable to bentgrasses. They do not, however, survive well under close cutting except where the summers are cool. These grasses are among the best for shady conditions.

For various reasons, it is usually safer to sow a mixture of grasses than to depend on one grass. For the greater part of region 1 the following mixture has proved quite satisfactory: Kentucky bluegrass 17 parts, reedtop 2 parts, white clover 1 part by weight. In the eastern part of this region where conditions are less favorable for Kentucky bluegrass, the following more general mixture has given good results: Kentucky bluegrass 10 parts, Chewings fescue 5 parts, reedtop 2 parts, colonial bent 1 part, white clover 1 part by weight.

In this region fall sowing is decidedly preferable to spring sowing. Where the seed is sown in the spring, it is usually advisable to add about 10 per cent Italian ryegrass to the mixture, reducing the amount of Kentucky bluegrass proportionately.

It is usually very difficult to maintain good turf under shade. In fact, it is almost impossible where the shade is very dense. Under such conditions it may be necessary to reseed each year. In the North, *Poa trivialis* is in general the most satisfactory grass, particularly in the shade of buildings. Under trees, especially where the soil is sandy, European red fescue or Chewings fescue will often thrive where other grasses fail. Much of the difficulty in growing grasses in the shade is due to the failure to recognize the need for more attention to watering and fertilizing, as a result of the demands of the trees.

#### REGION 2

The grass generally best suited to region 2 is Bermuda (fig. 5), although at the higher altitudes in the piedmont or under partially shaded conditions Kentucky bluegrass does very well. Bermuda grass may be started by sowing seed or by planting pieces of the stolons in the spring after the ground has warmed up thoroughly, or in the early fall. In the western part of this region the bents and Kentucky bluegrass usually do fairly well under irrigation, provided Bermuda grass can be kept from invading the lawn, which is no easy problem. In the humid part of region 2, where a legume is desired, Carolina clover, lespedeza, and white clover may be sown with the Bermuda grass. At the higher altitudes, Kentucky bluegrass may replace Bermuda grass.

The chief objection to Bermuda grass is the fact that it dies down in the winter and much of the beauty of the lawn is lost. To overcome this condition the Bermuda-grass lawn is "scalped," or mowed closely, in the fall, the soil loosened with a rake, and sown to Italian ryegrass. It is well to top-dress lightly with compost after sowing the grass seed. The ryegrass comes up quickly and continues to grow throughout the winter but dies down in the spring about the time the Bermuda grass starts growth.

In the northern part of this region Kentucky bluegrass usually succeeds well in the shade, provided the shade is not too dense. In the southern part none of the common grasses are particularly adapted to such a purpose. Under sufficiently mild conditions, St.

Augustine grass is one of the best shade grasses when sufficient moisture and plant food are supplied.

#### REGION 3

Most of the lawns in region 3 are started with a single grass rather than with a mixture. As the grasses suited are rather susceptible to cold they should be started in the spring after the ground warms up thoroughly. Carpet grass is especially desirable on moist soils. Seed is commercially available, though many lawns are started by setting out pieces of the plant. When seed is used, 3 to 5 pounds per 1,000 square feet is advised.

Bermuda grass can be used for the drier areas, especially where the soil is of heavy texture. Suggestions for starting a Bermuda-grass lawn and for sowing to Italian ryegrass for a winter lawn are discussed under region 2.

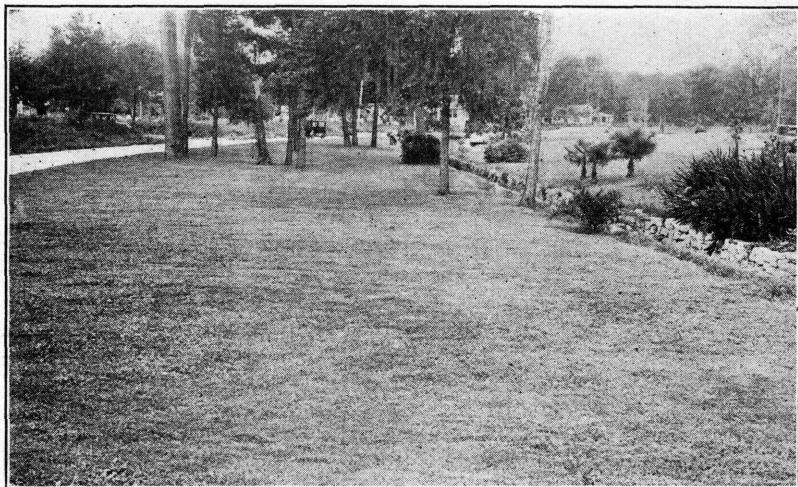


FIGURE 5.—Bermuda grass. This grass is particularly adapted to the heavy soils of region 2

Centipede grass (fig. 6) is rapidly becoming one of the outstanding lawn grasses in region 3. It is one of the best lawn grasses where the winters are mild, and will grow on any except poorly drained soils. As seed is not commercially available, all such lawns have to be started vegetatively.

St. Augustine grass (fig. 7) has no equal in Florida and the coastal plain of the Southern States as a shade grass. It grows equally well in the sun. If given plenty of water and nitrogen fertilizer, it will grow under practically all conditions in this section. It is one of the best grasses available for shady places; but, since seed is not available, lawns are started vegetatively.

#### GRASSES FOR AIRPORTS

Commercial flying is a rather recent development in the United States, and actual experience with grasses for airports is rather limited. Valuable suggestions may usually be obtained by studying the grasses that seem to thrive best in old meadows and pastures in



FIGURE 6.—Centipede grass. In region 3 this is rapidly becoming one of the outstanding lawn grasses

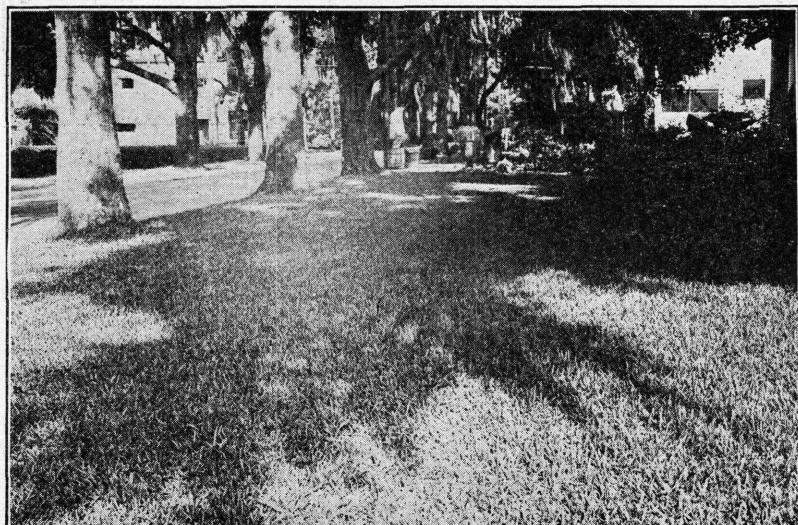


FIGURE 7.—St. Augustine grass. As a shade grass, St. Augustine has no equal in Florida and the coastal plain of the Southern States

the vicinity of the airport site. The results of investigations with turf grasses for lawns, golf courses, etc., furnish a useful source of information, though it is realized that airports usually are of considerable area and the methods used in establishing and maintaining turf on lawns and golf courses are too expensive for use on airports and are not warranted, since a turf of such fine quality is not essential. The main requirement is a turf that will stand up under rough usage. For this reason some of the coarser and tougher grasses should be included in the mixture. Experience indicates that no grass is likely to survive on the runways of airports where the traffic is heavy. For these areas it is likely that some material such as concrete or cinders will prove more satisfactory, and that no difficulty will be encountered in maintaining a turf on the remainder of the field that is used only in case of emergency.

In region 1 (fig. 2), where the moisture conditions are favorable and the soil is not acid, or only slightly so, and is well supplied with organic matter, where it is well drained, of a medium to heavy texture, and in a good state of fertility, Kentucky bluegrass has no superior and should constitute a considerable portion of any mixture. Under such conditions a mixture composed by weight of 3 parts Kentucky bluegrass, 1 part redtop, 1 part Italian or perennial rye, 1 part timothy, and one-half part white clover is suggested. Where the soil is acid and low in fertility there is little use in sowing Kentucky bluegrass. Under such circumstances a mixture composed by weight of 2 parts redtop, 2 parts red or Chewings fescue, 1 part timothy, 1 part meadow fescue, and 1 part of Italian or perennial ryegrass may be used. Of course, where the soil is low in fertility, none of these grasses can be expected to make satisfactory growth without the addition of fertilizer. For sandy areas that are inclined to be dry at times, a mixture composed by weight of 3 parts red fescue or Chewings fescue, 3 parts Canada bluegrass, 1 part redtop, 1 part timothy, and 1 part meadow fescue is advised. In the northern Great Plains, where the moisture is not sufficient for Kentucky bluegrass, crested wheatgrass, western wheatgrass, and smooth bromegrass may be used. If it is too dry for these grasses none of those of which seed is commercially available can be expected to succeed. Under such conditions the native sod makes the best turf for an airport, but when this has once been destroyed it is almost impossible to restore it.

For region 2 (fig. 2), Bermuda grass is in general the most suitable grass for airports.

For region 3 (fig. 2), the grasses suggested for different soil conditions for lawns are best suited to similar conditions for airports.

#### GRASSES FOR POLO FIELDS, ATHLETIC FIELDS, ETC.

The grasses that have given the best results on lawns in the various regions described in this bulletin are also likely to prove most satisfactory for polo fields, athletic fields, bowling greens, lawn-tennis courts, etc. Recommendations for preparing, seeding, and care as given for the lawn apply equally well here. Because of the size of polo and athletic fields it may not be practicable to give them as much attention along cultural lines as is given the lawn, or as tennis courts and bowling greens require.

## LAWN MANAGEMENT

After proper attention has been given to starting a lawn, the care that it receives has much to do with its success. In most parts of the country constant attention is necessary to maintain a good lawn.

## FERTILIZING

Proper fertilizing is essential to the development and maintenance of a satisfactory turf, but unfortunately this feature is often sadly neglected. As most city lawns are relatively small, the cost of proper fertilizing is not great. One of the first requirements is a liberal supply of available nitrogen. Grasses do not demand so much phosphorus and potash, and since these elements are less soluble than nitrogen they are often present in the soil in sufficient quantities, though to avoid the possibility of a deficiency a fertilizer containing some phosphorus and potash should be applied occasionally. A fertilizer that has given satisfactory results and one that is easily applied is a mixture consisting of 3 parts cottonseed meal and 1 part sulphate of ammonia. Where the cost of cottonseed meal is prohibitive or where it is not available, sewage sludge may be substituted for it. Where neither can be obtained a complete fertilizer high in nitrogen such as 6-8-4 may be used. Any of these should be applied at the rate of 15 to 20 pounds to 1,000 square feet. Experience indicates that the most liberal application of such fertilizers should be made early in the spring, as soon as the danger of hard freezes is over, as such application encourages a vigorous growth of grass that tends to hold the weeds in check. An early fall application of 10 to 15 pounds to 1,000 square feet is also desirable. If the grass shows evidence of lack of vigor in late spring or during the summer, a light application of some quick-acting fertilizer can be made. For this purpose there is nothing superior to sulphate of ammonia or nitrate of soda, but unless applied carefully they are liable to burn the grass. Using 3 pounds of either to 1,000 square feet is sufficient for one application. It is suggested that they be applied in mixture with good compost consisting of 3 parts of loam and 1 part of finely divided manure or mushroom soil spread evenly over the surface. After the mixture is applied it should be watered thoroughly. Bone meal is extensively used as a fertilizer on established lawns, though it is not particularly desirable for this purpose since it is low in nitrogen and the plant-food elements are slowly available. When used it should be applied in the late fall at the rate of 20 to 25 pounds to 1,000 square feet.

Fine well-rotted manure or mushroom soil applied in the late fall or early winter is beneficial when comparatively free from weed seeds and evenly distributed. It should be sifted or otherwise finely divided, as coarse manure may prove detrimental. High-grade pulverized poultry manure is also quite effective and where available at a reasonable cost can be used advantageously. It should be applied at the rate of 15 or 20 pounds to 1,000 square feet, preferably in the early fall. There are many special brands of lawn fertilizers on the market. While usually effective, they are likely to contain more phosphorus and potash in proportion to nitrogen than the grass requires when applied as surface applications to established lawns; their cost, too, is generally more than the fertilizing ingredients purchased separately.

**TOP-DRESSING**

Most grasses are benefited by an occasional top-dressing with a good compost consisting of about equal parts of manure, sand, and heavy-textured topsoil, as a clay loam. Mushroom soil or a good grade of garden loam is also suitable for this purpose. If the lawn soil consists largely of clay, the top-dressing should contain a higher percentage of sand; if very sandy, it should contain proportionately more clay. The top-dressing should be applied to a depth of one-fourth to three-eighths inch about every two years in the fall. Where the lawn has small pockets and bare places as a result of heaving during the winter and early spring, top-dressing will improve the condition very materially.

**LIMING**

Probably no one factor in lawn maintenance has been the cause of more general discussion or has been so widely abused as the use of lime. Not many years ago heavy annual applications of lime were the usual thing. More recently, experiments indicated that certain grasses do better on acid soils; and since general observations indicated that weeds were less troublesome under such conditions, the pendulum swung to the other extreme, and efforts were made to produce extremely acid conditions in the soil in the shortest time possible. Further investigations indicate, as is so often the case, that, everything considered, a course midway between these two extremes is safest and that a soil about neutral in reaction is likely to give the best results. Where soil is known to be acid, or sour, lime should be worked into it before the seed is sown. It is not possible to make a specific recommendation as to the amount, since requirements of different soils vary so widely. In the case of soils of average acidity, 40 to 50 pounds per 1,000 square feet should be ample. In most cases lime used as a top-dressing has not been very effective. Under the impression that it is a fertilizer, many persons make annual applications of lime without adding any plant food. Lime is not a fertilizer, as many seem to think; and even where it is used, the usual application of fertilizer should be made. Additions of lime alone, instead of improving the soil, are often harmful, as it merely encourages the weeds without benefiting the grass. If the grass is not making satisfactory growth after proper fertilizing, however, and if an examination shows the soil to be acid, an application of lime may be beneficial.

**ROLLING**

The freezing and thawing that take place during the winter months in most of the United States tend to push the grass out of the soil. Rolling early in the spring, while the soil is not too moist, with a 300 or 400 pound roller presses the plants back into position where they are able to grow to best advantage. Frequent rolling is not recommended for smoothing lawns, as it may puddle the soil. Smoothing is accomplished more readily by top-dressing.

**WATERING**

To maintain a vigorous growth of grass, watering is necessary. (Figs. 8 and 9.) Wherever possible, a permanent watering system should be installed before the lawn is seeded. Such a system is very

convenient and saves hours with the garden hose. Rarely is a lawn overwatered. During hot, dry weather the lawn should be watered frequently and thoroughly. The usual practice of sprinkling

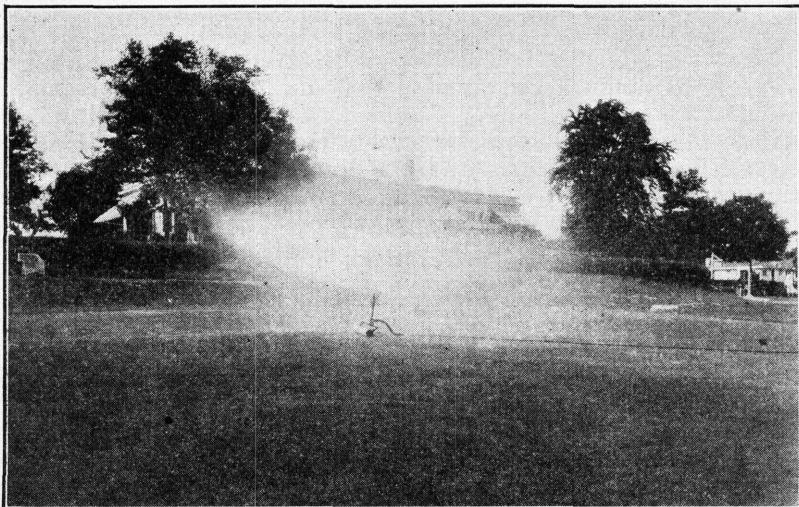


FIGURE 8.—Type of sprinkler advisable for large lawns

lightly each day is very objectionable. A thorough soaking encourages deep-root development, while the light sprinkling stimulates surface roots; and when watering is neglected the grass suffers.



FIGURE 9.—Lawn watered by a permanent watering system. Such a system saves hours with the garden hose

Furthermore, the deeper root system furnishes more area from which the plant can draw its nourishment. The lawn may be watered at any time of the day or night, though there is less loss from evapo-

ration when watered in the evening, which is also the most convenient time for most home owners. Where the lawn contains bents and fescues, however, early morning watering is preferred, as evening watering makes conditions more favorable for the brown-patch diseases. Grass beneath or near trees requires more water than that in the open; likewise, south and west exposures subjected to the direct rays of the sun require more moisture than less exposed areas. Slopes demand special attention on account of the rapid run-off.

#### MOWING

A newly sown lawn should be cut when the grass is 2 or 3 inches high. Not only is a lawn much more attractive when properly mowed, but sod-forming grasses are benefited by such treatment while some weeds are killed and the growth of others is checked. The grass should not be cut extremely close. Very close cutting, when the lawn is not mowed frequently, will injure the grass by sudden exposure to the sun after it has been shaded by the dense growth. The mower should be set to cut at a height of three-fourths of an inch to 1 inch.

No definite rule can be given regarding frequency of mowing, as everything depends upon the type of grass, the amount of fertilizer applied, the frequency of watering, weather conditions, etc. There is little danger of cutting too frequently. Clippings from the mower should be removed, as when left they tend to encourage diseases. If the lawn is fertilized and top-dressed properly the plant food lost by removal of the clippings will not be noticeable. The clippings make excellent compost when mixed with soil and left until thoroughly decomposed. However, in some instances where the growth is fine as a result of frequent cutting, the turf seems to be benefited by allowing the clippings to remain.

#### WEEDS

Weeds present one of the most difficult problems in lawn maintenance. (Fig. 10.) The amount of labor involved in keeping weeds out of a lawn may be reduced by making the conditions so nearly ideal for the lawn grass that it is always growing vigorously, thus tending to hold the weeds in check.

The most troublesome weeds are crabgrass, dandelions, plantain, and chickweed. Generally speaking, crabgrass is the worst pest that the lawnkeeper has to combat. It starts to grow after the weather is warm and continues to spread vigorously until the first frost occurs in the fall. Many people express surprise at the sudden dying out of what they considered was a very beautiful lawn, not realizing that the crabgrass, which is an annual, had invaded the lawn and smothered out the grasses that survive from year to year, thus leaving a brown unsightly lawn during the winter and necessitating reseeding. Unfortunately, the only known effective way of eradicating this pest is hand weeding. Home owners should familiarize themselves with its appearance when it is young, as it is more easily eradicated at that time. Often, however, crabgrass appears in such abundance as to render hand weeding out of the question.

In some sections dandelions become a serious pest in the lawn. The only sure method of eradicating them is hand weeding. The

individual plants should be cut 2 to 3 inches below the surface of the ground with a spud, an asparagus knife, or some similar tool. Shallow cutting is worse than useless, since new tops spring up quickly from the cut surface.

Plantain also becomes a pest in certain sections, and, as is the case with dandelions, hand weeding is the only effective remedy. The practice, unfortunately quite common, of liming the lawn heavily each spring without fertilizing favors the growth of dandelions and plantain.

Chickweed often appears in patches in the lawn. As a rule it is no great problem to cut out such patches. Where this is impracticable the weed usually can be destroyed by dusting the patches with what ammonium sulphate will adhere to the leaves, preferably when the leaves are wet from dew or as a result of sprinkling, leaving it for a



FIGURE 10.—Removing weeds from the lawn. Cut the roots as far as possible below the surface with a knife or spud

day, and then watering thoroughly. This will usually kill the chickweed, and while it may burn the grass, no permanent injury is likely to result.

Moss is sometimes troublesome on lawns. Usually its presence indicates an impoverished condition of the soil, poor drainage, or too much shade. Moss does not necessarily indicate an acid soil, as it grows where lime has been used abundantly. Where moss occurs scattered in small patches and where there is a uniform but weakly growth of grass, liberal fertilizing will usually increase the vigor of the grass so that the moss will gradually be crowded out. Sprinkling patches of moss liberally with ammonium sulphate, as described in the case of chickweed, is sometimes an effective means of destroying it. Large patches can be raked out and the bare areas reseeded.

The use of chemicals, thus far, has not proved a very effective means of controlling most lawn weeds. The reliable method of

clearing the lawn of weeds is to keep after them continually. Cut the root of the plant as far as possible below the surface with a knife or spud.

#### REMOVING LEAVES

Leaves from trees should be removed from the lawn, as they are likely to injure the grass by smothering it, especially when the layer is thick enough to hide the grass. Leaves contain very little available plant food and are practically worthless as a fertilizer unless composted until completely decayed. There is a rather general though erroneous belief that the grass is benefited by the protective covering furnished by leaves.

Grasses recommended for the different regions seldom require protection during the winter and are likely to be injured by the smothering and shading effects of leaves.

#### RENOVATING OLD LAWNS

When a lawn becomes thin and sickly looking, the question arises as to whether it is advisable to spade it up and start all over or to try to develop a satisfactory turf without disturbing the grass that is present. As a rule, it will be more satisfactory to start a new lawn. However, where there is a fairly even distribution of grass, it is usually possible to develop a good turf by giving proper attention to fertilizing, top-dressing, mowing, and watering. Such lawns should be first liberally fertilized in accordance with the suggestions given on page 12 and then top-dressed with one-fourth to three-eighths of an inch of a rich, garden loam or compost made with equal parts of topsoil, sand, and manure. Where there are many large bare patches in the lawn, it is better to spade the ground and start over, as it is difficult to produce a satisfactory lawn by reseeding bare areas.

#### PESTS AND DISEASES

##### INSECTS

Earthworms, grubs, and ants are the insects most generally infesting lawns. In the Southeast mole crickets sometimes become quite a pest. Grubs and earthworms have been successfully controlled by the use of arsenate of lead. An application of 5 pounds of this material thoroughly mixed with a bushel of moist soil or sand should be spread uniformly over 1,000 square feet of lawn. It may be necessary to repeat the application every year or two. It is advisable to water the lawn well after applying lead arsenate, in order to lessen the danger of poisoning chickens or other animals that might eat some of the grass.

Corrosive sublimate is very effective in ridding the soil of earthworms—2 or 3 ounces dissolved in 50 gallons of water is sufficient for 1,000 square feet of lawn. After the solution is applied it should be watered in thoroughly. Corrosive sublimate may also be applied dry by mixing 2 or 3 ounces with 2 cubic feet of dry sand and scattering the mixture uniformly over 1,000 square feet of lawn. Liberal watering should follow. Unless these instructions are carefully followed, serious burning of the grass is sure to result. It should be remembered that corrosive sublimate is a deadly poison.

Ants sometimes become quite a problem on the lawn, and while no entirely satisfactory means of control has been discovered, good

results have been obtained by injecting carbon disulphide into the nests by means of an oil can with a long spout or a syringe, the quantity varying from one-half to 2 or 3 ounces, depending upon the size of the nest. The entrance to the nest should then be closed. Carbon disulphide should be kept away from fire as its fumes are highly inflammable.

Mole crickets sometimes become very troublesome in the South-eastern States and do considerable damage by tunneling just beneath the surface of the ground. No entirely effective method for the control of these pests when they are working in lawns or turf has been developed. A poisoned bait has been used with considerable success under certain conditions against the Porto Rican mole cricket and in some cases might be used to advantage on lawns. The method of preparing and applying the bait is discussed in Farmers' Bulletin 1561, *The Porto Rican Mole Cricket*. Carbon-disulphide emulsion can be used, but that treatment is rather expensive, as the emulsion is applied at the rate of about one-half gallon to each square foot of grass. The emulsion should be thoroughly watered in, so that it will penetrate the burrows of the mole crickets. Liberal watering will also prevent injury to the grass. Directions for the preparation and application of carbon-disulphide emulsion can be obtained by writing to the Bureau of Entomology.

#### MOLES

Moles frequently tunnel in lawns in their search for food, leaving unsightly ridges over their runways. It is not uncommon for the grasses to turn brown over the tunnels, as the result of the cutting of the grass roots by the moles and the drying out of the soil.

Moles are not easy to control. Trapping has proved to be one of the dependable methods of destroying them. This and other control methods are discussed in Farmers' Bulletin 1247.

Materials with properties repellent to moles are often used successfully in driving them from a lawn. The runways should be opened with a stick at intervals of 10 to 15 feet and a teaspoonful of flake naphtha, moth balls, paradichlorobenzene, or lye inserted, after which the holes should be carefully closed with soil. Moles may be drowned occasionally by inserting the garden hose in the runways and flooding them.

#### DISEASES

The most serious diseases of turf grasses are what are known as large and small brown patch, which attack the bentgrasses, the fescues, redtop, and ryegrass. These diseases are most effectively controlled by the use of mercury compounds. Two ounces of calomel and 1 ounce of corrosive sublimate mixed with soil or sand applied to each 1,000 square feet of lawn will check the spread of these diseases. The lawn should be watered thoroughly after the application. It is necessary to repeat the treatment every time the disease makes its appearance. There is a leaf-spot disease that is sometimes quite injurious to Kentucky bluegrass, Bermuda, and other grasses, but so far there is no effective means known of controlling this disease.

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